CLAIMS

What is claimed is:

1. Gel beads comprising a hydrocolloid and an enzymatically effective amount of an immobilized enzyme in the beads, in which the gel beads have an average particle size of about 5 microns to 150 microns in diameter.

2. The gel beads of claim 1 in which the hydrocolloid is carrageenan.

3. The gel beads of claim 2 in which the gel beads have a diameter of 5 microns to 50 microns.

4. The gel beads of claim 3 in which the enzyme is selected from the group consisting of lipases and proteases.

5. The gel beads of claim 1 in which the hydrocolloid is kappa carrageenan.

6. The gel beads of claim 1 in which the enzyme is selected from the group consisting of oxidoreductases, transferases, hydrolases, lyases, isomerases, ligases, decarboxylases, carboxylases, aldolases, thiolases, and synthases.

7. The gel beads of claim 1 in which the enzyme is selected from the group consisting of lipases and proteases.

8. The gel beads of claim 1 in which the gel beads have a diameter of 5 microns to 50 microns.

9. A method for carrying out a chemical transformation, the method comprising contacting a reaction substrate and gel beads in the presence of a non-aqueous solvent for a time sufficient to convert at least a portion of the substrate to a product, in which:

the gel beads comprise a hydrocolloid and an enzymatically effective amount of an immobilized enzyme;

the gel beads have a network structure capable of swelling in aqueous media and an average particle size of about 5 microns to 150 microns in diameter; and

the gel beads are substantially insoluble in the non-aqueous solvent..

10. The method of claim 9 in which the hydrocolloid is carrageenan.

11. The method of claim 10 in which the gel beads have a diameter of 5 microns to 50 microns.

12. The method of claim 11 in which the enzyme is selected from the group consisting of lipases and proteases.

13. The method of claim 12 in which the product is a chiral material.

14. The method of claim 12 in which the hydrocolloid is kappa carrageenan.

15. The method of claim 9 in which the hydrocolloid is kappa carrageenan.

16. The method of claim 9 in which the enzyme is selected from the group consisting of oxidoreductases, transferases, hydrolases, lyases, isomerases, ligases, decarboxylases, carboxylases, aldolases, thiolases, and synthases.

17. The method of claim 9 in which the enzyme is selected from the group consisting of lipases and proteases.

18. The method of claim 9 in which the gel beads have a diameter of 5 microns to 50 microns.

19. The method of claim 9 in which the product is a chiral material.

20. Gel beads comprising a hydrocolloid and an enzymatically effective amount of an immobilized enzyme,

the gel beads prepared by a process comprising::

(a) forming dehydrated gel beads, the gel beads having a network structure capable of swelling in aqueous media and an average particle size of about 5 microns to 150 microns in diameter; and

(b) imbibing into the dehydrated hydrocolloid gel beads an aqueous solution of the enzyme.

21. The gel beads of claim 20 in which the hydrocolloid is carrageenan.

22. The gel beads of claim 20 in which the hydrocolloid is kappa carrageenan.

23. The gel beads of claim 20 in which the enzyme is selected from the group consisting of oxidoreductases, transferases, hydrolases, lyases, isomerases, ligases, decarboxylases, carboxylases, aldolases, thiolases, and synthases.

24. The gel beads of claim 20 in which the enzyme is selected from the group consisting of lipases and proteases.

25. The gel beads of claim 20 in which the method additionally comprises, after step (b), the step of dehydrating the imbibed gel beads or the step of removing excess liquid from the imbibed gel beads.

26. The gel beads of claim 20 in which:

the hydrocolloid is carrageenan;

the gel beads have a diameter of 5 microns to 50 microns; and

the aqueous solution of enzyme contains about 0.05 to 40 wt% enzyme.

27. A method for carrying out a chemical transformation, the method comprising contacting a reaction substrate and gel beads in the presence of a non-aqueous solvent for a time sufficient to convert at least a portion of the substrate to a product,

in which:

the gel beads comprise a hydrocolloid and an enzymatically effective amount of an immobilized enzyme;

the gel beads have an average particle size of about 5 microns to 150 microns in diameter;

the gel beads are substantially insoluble in the non-aqueous solvent; and

the gel beads are prepared by a process comprising::

(a) forming dehydrated gel beads, the gel beads having an average particle size of about 5 microns to 150 microns in diameter; and

(b) imbibing into the dehydrated hydrocolloid gel beads an aqueous solution of the enzyme.

28. The method of claim 27 in which the hydrocolloid is carrageenan.

29. The method of claim 27 in which the hydrocolloid is kappa carrageenan.

30. The method of claim 27 in which the enzyme is selected from the group consisting of oxidoreductases, transferases, hydrolases, lyases, isomerases, ligases, decarboxylases, carboxylases, aldolases, thiolases, and synthases.

31. The method of claim 27 in which the enzyme is selected from the group consisting of lipases and proteases.

32. The method of claim 27 in which the method additionally comprises, after step (b), the step of dehydrating the imbibed gel beads or the step of removing excess liquid from the imbibed gel beads.

33. The method of claim 27 in which:

the hydrocolloid is carrageenan;

the gel beads have a diameter of 5 microns to 50 microns; and

the aqueous solution of enzyme contains about 0.05 to 40 wt% enzyme.

34. The method of claim 33 in which the product is a chiral material.